

Compositional shifts in the understorey vegetation after the conversion from mixed deciduous forest to spruce monocultures

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It is generally assumed that the overstorey composition in forests plays a dominant role in determining the understorey species diversity and composition. Tree species have an effect on the herb layer by influencing for instance the light availability and by competing for soil nutrients and water. Furthermore, the quality of the tree litter profoundly influences the nutrient availability and other soil characteristics such as the pH and soil fauna. Therefore, we expect herb layer vegetation shifts following a conversion to another tree species. Since the 1950s, Norway spruce (*Picea abies*) monocultures are being planted as small islands in a matrix of mixed deciduous forest in the south of Belgium. We investigated the vegetation and the soil characteristics in forty spruce monocultures and paired, adjacent mixed deciduous stands in order to assess the impact of the past conversions to spruce on the soil and herb layer vegetation. The pH of the topsoil lowered significantly and the tree litter biomass increased due to the conversion to spruce. Nevertheless, the diversity in the deciduous stands did not differ significantly from the spruce stands. The mean local species diversity (α -diversity) in a plot as well as the total number of species occurring in the deciduous stands (γ -diversity) was equal to these of the spruce stands. Yet, the spruce monocultures showed a different composition from the deciduous matrix, contributing to a larger regional species pool and higher across site β -diversity. Indicator species in deciduous were mostly forbs and in spruce stands they were graminoids and ferns. The understorey vegetation in spruce stands contained more species that were light-demanding and acid tolerant. The conversion to spruce seems to have caused an ecosystem shift from a mesotrophic to an oligotrophic state. This resulted in a changed understorey composition, but understorey diversity per se did not change significant.

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